Docket No.: 1914-SPL
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of: Richard S. Potember, et al.

Application No.: 10/541,112 Confirmation No.: 4937

Filed: 06/30/2005 Art Unit: 1797

For: Hydroxyl Free Radical-Induced Decontamination of Airborne Spores, Viruses and Bacteria in a Dynamic System Examiner: Joyner, Kevin

APPEAL BRIEF

MS Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

As required under 37 CFR § 41.37(a), this brief is filed within two months of the Notice of Appeal filed in this case on March 20, 2008, and is in furtherance of said Notice of Appeal.

The fees required under 37 CFR § 41.20(b)(2) are dealt with as part of the e-Filing of this brief.

This brief contains items under the following headings as required by 37 CFR § 41.37 and MPEP § 1205.2:

I. REAL PARTY IN INTEREST

The real party in interest for this appeal is: The Johns Hopkins University.

II. RELATED APPEALS AND INTERFERENCES

There is a related appeal (Notice of Appeal filed 03/13/2008) in U.S. patent application, serial no. 10/257,196, 10/09/2002, Method and Apparatus for Air Treatment, Art Unit: 1797, Examiner: Conley, Sean Everett. Other than that appeal, there are no other appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

A. Total Number of Claims in the Application

There are 47 claims pending in the application.

B. Current Status of Claims

1. Claims canceled: 5.
2. Claims withdrawn from consideration but not canceled: 31-48.
3. Claims pending: 1-4 and 6-48.
4. Claims allowed: None.
5. Claims rejected: 1-4 and 6-30.

C. Claims On Appeal

The claims on appeal are claims 1-4 and 6-30.

IV. STATUS OF AMENDMENTS

Applicant did not file an Amendment After Final Rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The invention is an ultraviolet/hydrogen peroxide (UV/H_2O_2) system that can neutralize airborne pathogens in large volumes of moving, contaminated air in real time. As shown in Fig. 1, the inventive UV/H_2O_2 system has a flow-through reaction chamber 101 that has a chamber air inlet 102 to admit pathogen-contaminated air, and a chamber air outlet 109 to release pathogen-neutralized air. A space is defined between the chamber air inlet and outlet that accommodates the passage of moving air through the reaction chamber (see also specification, paragraph [0041]).

As also shown in Fig. 1, the reaction chamber contains one or more ultraviolet (UV) light sources 106 that emit high intensity, broad-spectrum UV light as well as a hydrogen peroxide (H_2O_2) generator 104 connected to a water supply line 103 or, in another embodiment, the aqueous H_2O_2 supply (tank or reservoir or generator) is disposed outside the reaction chamber 101 and connected by a supply line 212 (Fig. 2) to a nozzle 205 (Fig. 2) disposed inside the reaction chamber. Aqueous H_2O_2 produced by the hydrogen peroxide generator 104 passes through a nozzle 105 and into the reaction chamber 101 as a spray, fine mist or vapor. The aqueous H_2O_2 reacts with the UV light provided by the UV light source 106 to form hydroxyl free radicals (OH^-)111 (see also specification, paragraphs [0042] and [0043]).

In addition to the above, a porous matrix 107, such as metal foam, is installed in the reaction chamber to provide additional surface area on which the free radicals can react with the pathogens. The metal foam can be aluminum, copper, silver and oxides thereof. In one embodiment, the porous matrix covers the reaction chamber air outlet 109 to assure that all air leaving the UV/ H_2O_2 system passes through the metal foam matrix. The porous matrix is especially useful where large volumes of air are being decontaminated as, in addition to providing the additional surface area, its presence does not noticeably impede airflow (Fig. 1 and specification, paragraphs [0045] and [0088]-[0090]).

The UV/H_2O_2 system may further contain one or more optional removable solid supports coated with one or more ozone removal catalysts 208 (Fig. 2) which in one embodiment can be all aluminum (specification, paragraph [0052]). In other embodiments a microwave generator and/or an ultrasonic wave generator may also be disposed in the reaction chamber (specification, paragraph [0093]). The UV/H_2O_2 system may have sensors to monitor ozone, humidity, temperature, and/or ultraviolet light levels. In one embodiment the UV/H_2O_2 system is fully automated and can dispense H_2O_2 and/or ozone based on measurements obtained from the sensors (specification, paragraph [0045]).

In operation, in one embodiment, the system generates highly reactive free radical hydroxyl ions (OH^-) by irradiating aqueous hydrogen peroxide with UV light. H_2O_2 can be used as the sole source of free radicals or it can be used together with ozone, which also generates highly reactive free radicals upon irradiation with UV light in a moist environment. The presence of the porous matrix, as noted above, provides additional surface area on which the free radicals can react with the pathogens present in the airflow. The pathogens that can be neutralized by the inventive system include bacteria, viruses, spores, fungi, molds and parasites (specification, paragraph [0030]).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. § 103 Rejections:

1. Whether claims 1, 4-9, 12, 16, 18, 19, 23-27 and 29-30 are unpatentable under 35 USC 103(a) over the combination of Goswani (US 5,993,738) in view of Korte (Derwent Pub. No. DE 4001305) and Reisfeld et al. (US 6,884,399).

2. Whether claims 2 and 3 are unpatentable under 35 USC 103(a) over the combination of Goswani (US 5,993,738) in view of Korte (Derwent Pub. No. DE 4001305) and Reisfeld et al. (US 6,884,399) as applied to claim 1 above, and further in view of Murphy et al. (US 5,972,196).

3. Whether claims 10 and 28 are unpatentable under 35 USC 103(a) over the combination of Goswani (US 5,993,738) in view of Korte (Derwent Pub. No. DE 4001305) and Reisfeld et al. (US 6,884,399) as applied to claims 1 and 27 above, and further in view of Wen (US 6,673,137).

4. Whether claims 11, 13 and 14 are unpatentable under 35 USC 103(a) over the combination of Goswani (US 5,993,738) in view of Korte (Derwent Pub. No. DE 4001305) as applied to claims 1 and 12 above, and further in view of Kekez (US 5,882,591).

5. Whether claim 15 is unpatentable under 35 USC 103(a) over the combination of Goswani (US 5,993,738) in view of Korte (Derwent Pub. No. DE 4001305), Reisfeld et al. (US6,884,399) and Kekez (US 5,882,591) as applied to claims 1 and 12 above, and further in view of Murphy et al. (US 5,972,196).

6. Whether claims 17, 20 and 21 are unpatentable under 35 USC 103(a) over the combination of Goswani (US 5,993,738) in view of Korte (Derwent Pub. No. DE 4001305) and Reisfeld et al. (US 6,884,399) as applied to claim 16 above, and further in view of Berman (US 5,766,455).

7. Whether claim 22 is unpatentable under 35 USC 103(a) over the combination of Goswani (US 5,993,738) in view of Korte (Derwent Pub. No. DE 4001305), Reisfeld et al. (US 6,884,399) and Kekez (US 5,882,591) as applied to claim13 above, and further in view of Patapoff et al. (US 5,656,246).

B. Double Patenting Rejection:

The Examiner has provisionally rejected claims 1, 4, 5-13, 15-17, 22-24, and 27-28 on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1,

2, 4, 5, 7-10, 18 and 19 of copending application no. 10/257,196 in view of Korte (Derwent Pub. No. DE 4001305).

VII. ARGUMENT

A. § 103 Rejections:

1. Applicants' claim 1 recites a porous matrix as an element of the invention. In the rejection of claim 1, only Reisfeld et al. is cited as disclosing a porous matrix (citing col. 4, lines 1-25). In fact, Reisfeld et al. discloses a photocatalytic air purifier comprising, in part, a honeycombed filter 12 having a catalytic coating activated by UV light (see also Fig. 3). Reisfeld et al. further discloses that organic compounds in the air react with the activated catalyst and are converted into water and carbon dioxide (col. 4, lines 26-34). It is clear from Reisfeld et al. that the purpose of the filter is to provide a surface on which to place the catalytic coating.

The porous matrix of Applicants' invention, on the other hand, is not primarily used as a filter having a coating to react with pollutants in the air, but, rather, Applicants' porous matrix has a different primary function and purpose, that is, to provide additional surface area on which free radicals can react with pathogens, as recited in claim 1. See Applicants' specification, paragraph [0045]. Applicants normally neutralize pathogens through means other than the porous matrix and, therefore, Reisfeld et al., which, as noted, only discloses a filter with a catalytic coating for treating air is inapposite.

Because the references in combination do not suggest the use of a porous matrix to provide increased surface area on which pathogen neutralization can occur, the references cannot be combined to render obvious claim 1, as amended, and, therefore, also can not render obvious claims 4-9, 12, 16, 18, 19, 23-27, and 29-30 which depend therefrom.

2. For the reasons cited above in Applicants' response to the rejection of claims 1, as amended, 4-9, 12, 16, 18, 19, 23-27 and 29-30 under 35 USC 103(a), the use of Goswani, Korte and

Reisfeld et al. as references is inapposite, and, therefore, cannot be combined with Murphy et al. to render obvious claims 2 and 3.

3. For the reasons cited above in Applicants' response to the rejection of claims 1, as amended, 4-9, 12, 16, 18, 19, 23-27 and 29-30 under 35 USC 103(a), the use of Goswani, Korte and Reisfeld et al. as references is inapposite, and, therefore, cannot be combined with Wen to render obvious claims 10 and 28.

4. For the reasons cited above in Applicants' response to the rejection of claims 1, as amended, 4-9, 12, 16, 18, 19, 23-27 and 29-30 under 35 USC 103(a), the use of Goswani, Korte and Reisfeld et al. as references is inapposite, and, therefore, cannot be combined with Kekez et al. to render obvious claims 11, 13 and 14.

5. For the reasons cited above in Applicants' response to the rejection of claims 1, as amended, 4-9, 11-14, 16, 18, 19, 23-27 and 29-30 under 35 USC 103(a), the use of Goswani, Korte and Reisfeld et al. as references is inapposite, and, therefore, cannot be combined with Kekez and Murphy et al. to render obvious claim 15.

6. For the reasons cited above in Applicants' response to the rejection of claims 1, as amended, 4-9, 12, 16, 18, 19, 23-27 and 29-30 under 35 USC 103(a), the use of Goswani, Korte and Reisfeld et al. as references is inapposite, and, therefore, cannot be combined with Berman et al. to render obvious claims 17, 20 and 21.

7. For the reasons cited above in Applicants' response to the rejection of claims 1, as amended, 4-9, 12, 16, 18, 19, 23-27 and 29-30 under 35 USC 103(a), the use of Goswani, Korte and Reisfeld et al. as references is inapposite, and, therefore, cannot be combined with Kekez and Patapoff et al. to render obvious claim 22.

Double Patenting Rejection:

Applicants will file a terminal disclaimer to obviate this rejection upon receiving an indication of allowable subject matter.

VIII. CLAIMS

A copy of the claims involved in the present appeal is attached hereto as Appendix A.

Dated: May 20, 2008

Respectfully submitted,

The Johns Hopkins University
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CLAIMS APPENDIX

Claims Involved in the Appeal of Application Serial No. 10/541,112

Claim 1. A system for neutralizing airborne pathogens, comprising:

A. a flow-through reaction chamber having:

1. a chamber air inlet at a first end of the reaction chamber to admit air contaminated with pathogens, and

2. a chamber air outlet at a second end of the reaction chamber to release decontaminated air, and defining between the air inlet and air outlet a passageway,

B. a supply of aqueous hydrogen peroxide connected to a conduit for introducing aqueous hydrogen peroxide into the reaction chamber,

C. an ultraviolet light source for introducing UV light into the reaction chamber; and

D. a porous matrix for providing additional surface area on which the neutralization of pathogens can occur.

Claim 2. The system as in claim 1, wherein the supply of aqueous hydrogen peroxide is a hydrogen peroxide generator connected to a water supply and a source of electricity.

Claim 3. The system as in claim 1, wherein the supply of aqueous hydrogen peroxide is a reservoir of aqueous hydrogen peroxide.

Claim 4. The system as in claim 1, wherein the conduit is a nozzle disposed inside the reaction chamber.

Claim 6. The system as in claim 1, wherein the porous matrix is metal foam.

Claim 7. The system as in claim 6, wherein the metal is selected from the group comprising aluminum, copper, silver, and oxides thereof.

Claim 8. The system as in claim 6, wherein the metal foam is aluminum foam.

Claim 9. The system as in claim 1, wherein the porous matrix is removable.

Claim 10. The system as in claim 1, further comprising a microwave generator to introduce microwaves into the reaction chamber.

Claim 11. The system as in claim 1, further comprising an ultrasonic wave generator to introduce ultrasonic waves into the reaction chamber.

Claim 12. The system as in claim 1, further comprising an ozone supply for introducing ozone into the reaction chamber.

Claim 13. The system as in claim 12, wherein the ozone supply is an ozone generator.

Claim 14. The system as in claim 12, wherein the ozone supply is a reservoir that contains ozone.

Claim 15. The system of claim 12, further comprising a mixing chamber for mixing ozone and aqueous hydrogen peroxide.

Claim 16. The system of claim 1, wherein the reaction chamber further comprises a solid support.

Claim 17. The system of claim 16, wherein the solid support comprises ozone removal catalysts.

Claim 18. The system of claim 16, wherein the solid support comprises compounds that adsorb or neutralize pathogens.

Claim 19. The system of claim 16, wherein the solid support comprises compounds that adsorb or neutralize chemical toxins.

Claim 20. The system of claim 19, wherein the solid support comprises ozone removal catalysts.

Claim 21. The system of claim 17, wherein the ozone removal catalyst is a member selected from the group comprising all-aluminum catalysts, a carbon supported metal oxide catalyst, $CuCl_2$-coated carbon fibers, carbon-iron aerosol particles, alumina, platinum, palladium, and nickel.

Claim 22. The system of claim 13, wherein the ozone generator is a corona discharge generator.

Claim 23. The system as in claim 1, configured for operation in a continuous mode.

Claim 24. The system as in claim 1, configured to be activated upon demand.

Claim 25. The system of claim 1, further comprising a fan to move air through the passageway.

Claim 26. The system of claim 1, wherein an amount of hydrogen peroxide in the reaction chamber is controlled by sensors.

Claim 27. The system as in claim 1, wherein the ultraviolet light source emits high intensity UV light.

Claim 28. The system as in claim 27, wherein the ultraviolet light source emits UV light having a wavelength in a range from about 250 nanometers to about 300 nanometers.

Claim 29. The system of claim 1, wherein a concentration of hydrogen peroxide in the aqueous hydrogen peroxide supply is from about 1% to about 50%.

Claim 30. The system as in claim 1, wherein a concentration of hydrogen peroxide in the aqueous hydrogen peroxide supply is from about 1% to about 25%.

EVIDENCE APPENDIX

No evidence pursuant to §§ 1.130, 1.131, or 1.132 or entered by or relied upon by the examiner is being submitted.

RELATED PROCEEDINGS APPENDIX

A related proceeding is referenced in II. above, however, no decision has been rendered in that appeal and, hence, copies of decisions in related proceedings are not provided.